EN200

LAB #11

PROPELLER DEMONSTRATION

Instructions

1. This lab is **conducted in the hydrolab** on the lab deck of Rickover Hall.

2. You will need to **bring this lab to the lab period**.

3. The lab consists of 2 separate parts - each aiming to reinforce a different aspect of understanding of ship propellers.

   - **Propeller description**. A member of the hydrolab staff will discuss the different types of propeller and the nomenclature used to describe them.

   - **Circulating Water Channel**. A propeller will be observed operating in a circulating water channel under different conditions.

4. The lab is to be performed and submitted individually. You can ask questions and discuss the content of the lab, but the **submitted work must be your own**.

5. **All work must be shown on your lab for proper credit.** This means that you must show generalized equations, substitution of numbers, units and final answers. Engineering is communication. Other people should be able to understand your work.

6. **This lab is to be submitted at the end of the lab period**.

7. There should be sufficient work to last the entire 1 hour and 50 minutes of this lab. If you do finish early then check your work. If you get less than 100% you have done yourself an injustice by finishing early.

Student Information:

Name: _____

Section: _____

Date: _____

Aim:

- Introduce the student to the different types of ship propeller.
- Familiarize the student with the nomenclature used to describe ship propellers.
- Reinforce the students understanding of propeller cavitation and ventilation.

Part 1: Lab Description

Information

1. The lab consists of 2 separate parts.

    - **Propeller Description.** In the first part of the lab several different types of propeller will be discussed along with their uses and nomenclature.
    - **Circulating Water Channel.** The second part of the lab consists of a demonstration of a propeller operating under different conditions in a circulating water channel.

Apparatus

2. The apparatus consists of:

    - Several propeller models.
    - A 7" diameter propeller mounted within a circulating water channel.
    - A stroboscopic light source timed to coincide with propeller revolutions.

3. The circulating water channel provides for a continuous, controlled flow of water past the propeller which is mounted in the working section of the channel so that the propeller is upstream of its supporting bullet. This arrangement is designed to provide a turbulence free, uniform flow of water past the propeller with an air/water interface above it.

4. By coinciding the stroboscopic light source with the revolutions of the propeller it is possible to make the propeller appear stationary. This enables cavitation and ventilation effects to be observed with sufficient accuracy with the naked eye.

Part 2: Propeller Description Questions

Propeller Nomenclature

1. Label the following propeller parts on the 2 views provided at Figure 1. Only one blade has been drawn for clarity.

   - Propeller Hub Blade Root Blade Tip
   - Trailing Edge (TE) Leading Edge (LE) Propeller Diameter

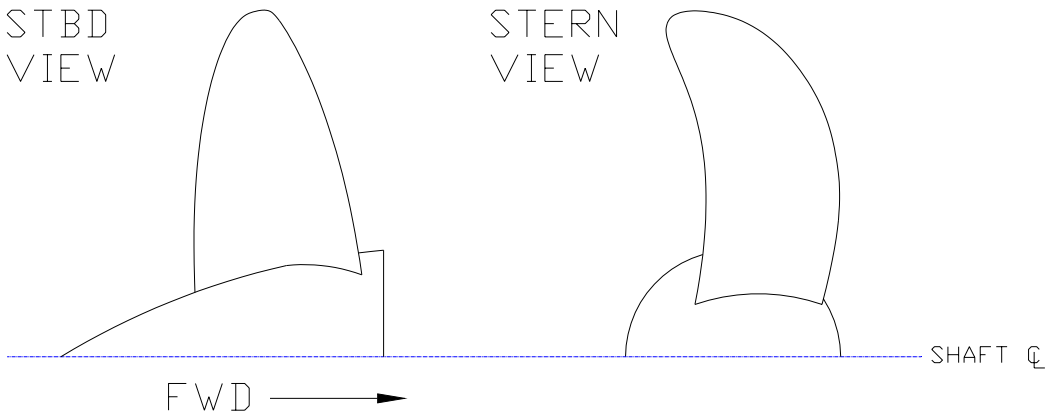


Figure 1 – Stbd and Stern Views of a Propeller Blade

2. What is meant by propeller pitch? _____

   _____

   In which 2 ways can pitch be measured?

   a. _____

   b. _____

3. What is meant by a constant pitch propeller? _____

   _____

4. What is meant by a variable pitch propeller?_____

   _____

What advantage does it have over a constant pitch propeller? _____

_____

5. What is meant by a controllable pitch propeller?_____

   What advantage does it have over a fixed pitch propeller. Consider the whole drive train in your answer._____

   _____

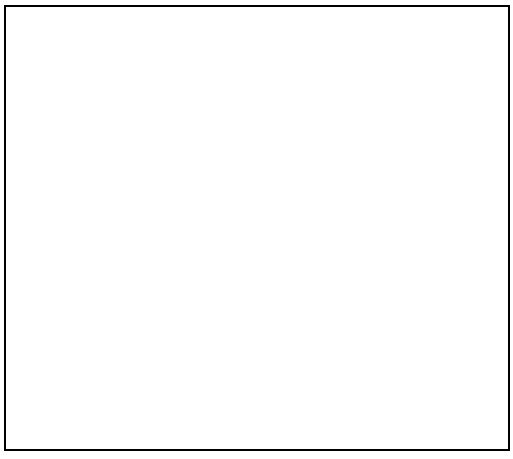
6. What are the advantages of a skewed propeller? _____

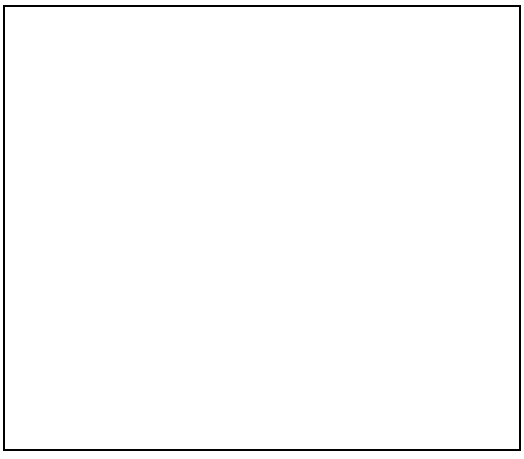
   _____

   What are its disadvantages? _____

   _____

7. In the boxes below sketch a highly skewed propeller and a propeller with no skew. **Ensure you show the direction of propeller rotation.**





8. What advantages are provided by placing a propeller in a 'nozzle'?

   Advantage 1 _____

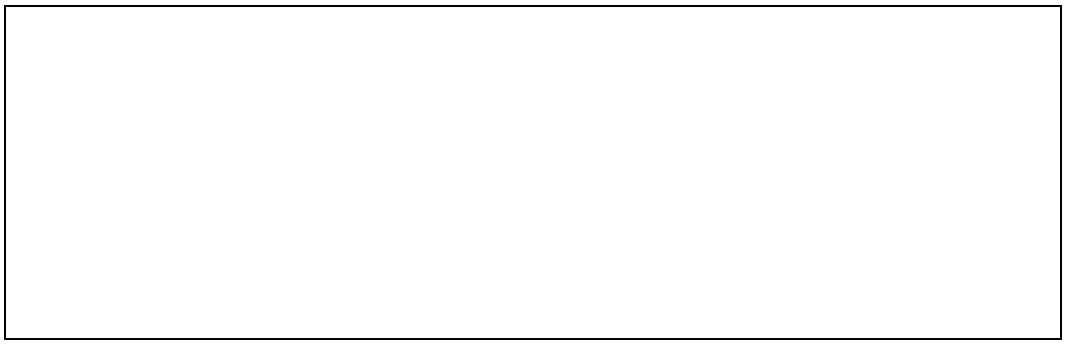
   Advantage 2 _____

9. What type of ships are often fitted with nozzles?_____

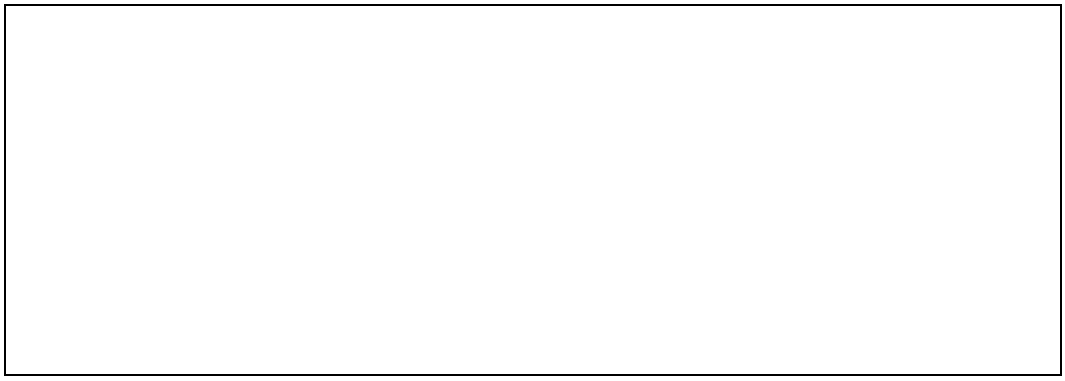
Part 3: Circulating Water Channel Questions

Cavitation

1. In the box below sketch the cavitation pattern caused when blade tip cavitation was being created in the channel.



2. In the box below sketch the cavitation pattern caused when sheet cavitation was being created in the channel.



3. Give 2 problems created by these types of cavitation.

   Problem 1:_____

   Problem 2:_____

4. What can the ship driver do to prevent the cavitation effects sketched in 1 & 2 from occurring?_____

_____

5. What other type of cavitation could not be demonstrated in the circulating water channel?_____

What is it caused by? _____

How can it be prevented? _____

_____

Ventilation

6. What is ventilation? _____

_____

7. Give 2 ship conditions that could cause its propeller to ventilate.

Condition 1:_____

Condition 2:_____